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UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF WASHINGTON

HANFORD CHALLENGE, UNITED ASSOCIATION OF PLUMBERS AND STEAMFITTERS LOCAL UNION, and the STATE OF WASHINGTON,

Plaintiffs,

v.

ERNEST J. MONIZ, in his official capacity as Secretary, the UNITED STATES DEPARTMENT OF ENERGY, and WASHINGTON RIVER PROTECTION SOLUTIONS LLC,

Defendants.

NO. 4:15-cv-05086-TOR

(*consolidated with* NO. 4:15-cv-05087-TOR)

DECLARATION OF BRUCE MILLER IN SUPPORT OF PLAINTIFF STATE OF WASHINGTON'S MOTION FOR PRELIMINARY INJUNCTION

I, BRUCE MILLER, declare under penalty of perjury under the laws of the state of Washington that the following is true and correct.

1. I am over the age of 18, competent to be a witness herein, and make this declaration in that capacity.

2. I am a Certified Industrial Hygienist with the American Board of Industrial Hygiene, #6439. I obtained my certification on July 24, 1994. In 1990, I received a Bachelor of Science degree in Industrial Technology from Southern Illinois University. I have a Masters in Science in Industrial Hygiene that I received from Central Missouri State University in 1992. A true and correct copy of my curriculum vitae is attached as Exhibit 1.

3. I am the president of Health and Safety Services, LLC, located in Idaho Falls, Idaho. Health and Safety Services provides health and safety consulting services. Health and Safety Services specializes in case consulting in matters involving workplace accidents, injuries, and Occupational Safety and Health compliance for General Industry, Construction, and the Department of Energy regulations.

4. I have been asked by the Washington State Attorney General's Office (State) to provide this declaration in the above-captioned lawsuit. As I understand it, the State has brought a suit against the United States Department of Energy (DOE) and Washington River Protection Solutions, LLC (WRPS), under 42 U.S.C. § 6972(a)(1)(B), on the grounds that chemical vapors released

from or near the tank farms at Hanford facility's 200 Area present an imminent and substantial endangerment to human health. I am making this declaration in support of the State of Washington's Motion for Preliminary Injunction. I anticipate reviewing additional records and transcripts of any depositions of DOE and WRPS staff, and producing a full report on industrial hygiene (IH) issues for this matter, which is due in August of this year. That report is expected to contain additional measures that DOE and WRPS will need to implement to adequately protect Hanford workers from chemical vapors. However, at this early stage of the litigation, I am providing opinions in this declaration as to (1) the presence of a currently uncontrolled vapor hazard at the tank farms that continues to expose tank farm workers to concentrations of multiple chemicals that are causing health effects in these workers, (2) how DOE and WRPS are failing to meet the applicable occupational safety and health standards through their current Worker Safety and Health Program and Integrated Safety Management System in protecting workers in or near the Hanford tank farms, and (3) what actions DOE and WRPS should undertake immediately to protect these workers.

5. I have 25 years of experience in comprehensive health and safety practice and 20 years of specialized environmental remediation and

construction experience at DOE, U.S. Army Corps of Engineers, Department of Defense (DoD), and National Aeronautics and Space Administration sites.

a. In addition to service in the United States Air Force within the Bioenvironmental Engineering career field, I have been employed by DOE contractors and consulting firms supporting the Idaho National Laboratory and completed or supported projects at other DOE sites including Hanford National Laboratory, Los Alamos National Laboratory, Pantex Plant, Argonne National Laboratories (East and West), Oak Ridge National Laboratory, Savanah River National Laboratory, and Sandia National Laboratory.

b. My experience includes: serving as a health and safety director for four subsidiary companies located in 16 regional offices with more than 400 employees; health and safety program and project manager (certified industrial hygienist-required); developing all corporate health and safety programs to implement federal, state, and agency-specific (e.g., DOE, DoD, U.S. Army Corps of Engineers) regulatory requirements for occupational health and safety, radiological protection, medical surveillance, 10 C.F.R. § 851 mandated Worker Safety and Health Programs, DOE Acquisition Regulation 970.5223-1 required

Integrated Safety Management Systems Programs, and project plans; and providing direct industrial hygiene and safety field support and oversight to professional health, safety, and radiological staff for projects at some of the most complex hazardous and mixed waste (radiological and hazards waste) sites in the country.

c. Projects that I have provided occupational safety and health guidance, support, and oversight to include: excavation of mixed waste; drilling, sampling and logging in transuranic mixed waste[1] pits; sampling, testing and deployment technologies to stabilize radiological contaminated soils and recover high radiation materials; construction of Category 2 nuclear facilities; radiological decommissioning and heavy demolition of nuclear facilities; waste management and retrieval in radioactive transuranic mixed waste; remediation high explosive

[1] Transuranic waste (TRU) is material contaminated with transuranic elements artificially made, radioactive elements, such as neptunium, plutonium, americium, and others that have atomic numbers higher than uranium in the periodic table of elements. Transuranic waste is primarily produced from recycling spent fuel or using plutonium to fabricate nuclear weapons.

fragment and unexploded ordinance sites throughout the DOE complex and at numerous DoD facilities and for numerous U.S. Army Corp of Engineers sites districts; and hurricane recovery/ reconstruction.

6. Industrial Hygiene is a science devoted to the anticipation, recognition, evaluation, prevention, and control of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well-being, or significant discomfort among workers or among citizens of the community. Industrial hygienists use a hierarchy of controls to prioritize the methods to control hazards to protect workers. The hierarchy of controls is made up of the following controls in this preferred order:

a. Elimination: removal of the hazard. This is the most effective method to control a risk because the hazard is no longer present. It is the preferred way to control a hazard and should be used whenever possible.

b. Substitution: replacement of the hazard. Substitution occurs when a new material or form of material that is less hazardous or harmful is used in place of a more hazardous material or form of material.

c. Engineering controls: isolating people from the hazard. If elimination or substitution is not feasible, or does not completely

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eliminate a potential hazard, then engineering controls must be implemented to minimize the potential exposure hazard. Engineering controls are methods that are built into the design of a plant, equipment, or process to minimize the hazard. Basic types of engineering controls include:

(1) Process control. This involves changing the way a job activity or process is done to reduce the risk.

(2) Enclosure and/or isolation of emission source. This control involves the use of a physical barrier or enclosure to separate the worker from the hazard.

(3) Ventilation. Under this method, contaminated air is either removed from or clean air is added to the work environment.

d. Administrative controls: establishment of procedures or protocols that reduce the exposure to the hazard. If a hazard is not completely controlled following the implementation of engineering controls, then administrative and work practice controls must be employed.

e. Personal protective equipment (PPE): protecting workers with PPE. PPE is the least preferred option of controlling workplace

hazards and it should only be used to supplement other control measures to reduce exposures under very specific circumstances. Use of PPE is listed as the last and least preferred method of control in the industrial hygiene hierarchy because PPE may "fail" (stop protecting the worker) with little or no warning. For example, "breakthrough" can occur with gloves, clothing, and respirator cartridges ("breakthrough" in this context is when a chemical permeates completely through a material or object rendering the PPE no longer effective and the worker can become exposed to the chemical).

7. I have personal experience working on occupational safety and health issues at the Hanford facility.

a. From August to September, 2009, I worked as a Technical Consultant for DOE, Office of River Protection at the Hanford Site. In this position, I prepared an Independent Government Cost Estimate evaluation and report of WRPS's Chronic Beryllium Disease Prevention Program (CBDPP) for the Hanford Tank Farm Beryllium Program. The purpose of this evaluation was to align and coordinate all WRPS programmatic elements with the Hanford site-wide CBDPP. This work required me to review all WRPS beryllium-specific and general industrial

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hygiene exposure assessment procedures and strategies, medical surveillance related to potential beryllium exposures, training to work around beryllium in a safe manner, and sampling strategy documentation used to develop the WRPS CBDPP cost estimate.

b. In addition, I had corporate health and safety oversight responsibility and prepared (or reviewed and approved) all project health and safety plans for Hanford engineering and remediation projects conducted by our Richland, Washington office staff. Examples of Hanford projects I have worked on include: 107 North Basin Recirculation Building Tank Waste Removal and Processing; In-situ TRU Waste Delineation and Waste Removal at Hanford 618-10 and 618 -11 Burial Ground Demonstration; Decontamination and Decommissioning of the Kadlec Hospital Emergency Decontamination Facility; In-situ Vertical Pipe Unit TRU Waste Delineation and Waste Removal at Hanford 618-10 and 618-11 Burial Grounds Demonstration; and 118-K-1 Drilling & In-Situ Radiological Characterization.

c. In addition to my personal experience at the Hanford Site, I have reviewed a number of reports and documents addressing the tank farms located at the Hanford site's 200 Area, the chemicals located in the

tanks at those farms, and tank farm vapor exposures. Those reports and documents are included in the Appendix to my declaration.

8. From my review of the documents listed in the Appendix, I have learned the following facts concerning the underground storage tanks at the 200 Area at the Hanford Site.

a. The 200 Area has 18 tank farms within the 200-East Area that contain 177 underground storage tanks of which 149 are single shell tanks (SSTs) and 28 are double shell tanks (DSTs). The tanks in these farms contain waste commonly referred to as being of three types: highly radioactive sludge and lower level radioactive supernatant and saltcake. The high-level waste sludges contain concentrations of both radionuclides and chemicals (bismuth, cadmium, chromium, iron, nickel, etc.) at very high levels. Used solvent and complexing agents from separations processes also were discharged to the tanks. Over time and as a result of chemical and radiolytic reactions, the chemical moieties have degraded and produced many smaller organic and inorganic molecules.

b. Individuals who work in and near the tank farms include chemical operators, tank farm specialists, training coordinators, pipe-

fitters, general maintenance workers, administrators, electricians, safety representatives, project planners, health physics technicians, industrial hygienists, project managers, engineers, project facilitators, carpenters, and quality control inspectors. *See* Ex. 2 at page 8. Attached as Exhibit 2 to my declaration is a true and correct copy of the National Institute for Occupational Safety and Health (NIOSH) of the CDC, *NIOSH Health Hazard Evaluation Report: HETA #2004-0145-2941*, July 2004.

c. The vapor emissions from Hanford waste tank vents, stacks, alternative tank leakage pathways, and overflow and transfer lines originate from the waste material in the tanks. Tank head space composition determines the vapor composition of the vent, stack, and most fugitive emissions. Waste disturbing activities (e.g., waste retrieval activities–the pumping of waste from one tank to another tank, or the sluicing of waste in the tanks so that the waste can be pumped out) can greatly alter the concentration and composition of the head space gases and vapors. Vapors are emitted from tanks through the risers when they are open to the atmosphere. The older SSTs are designed to breathe passively to the atmosphere through HEPA filters. DSTs are equipped

with elevated exhaust stacks through which vapors are actively exhausted to ventilate the tanks. Vapors can also escape as fugitive emissions through leaking valves and other sources. Vapor hazards can be high at vapor sources. Workers do not have to be directly working with waste to be exposed. For example, workers have reported exposures that cause health effects from standing or working near a vapor source. *See* Ex. 3 at DOE000002-06. Attached as Exhibit 3 to my declaration is a true and correct copy of the CH2M-32068-FP, *Hanford Chemical Vapors: Worker Concerns and Exposure Evaluation*, December 2006. Exposures to vapors can be sustained by workers who encounter bolus concentrations released from tanks at multiple possible locations within the tank farms. These bolus exposures can potentially include concentrations of multiple chemicals that may act additively to cause adverse health effects.

9. The following are my opinions of the applicable occupational safety and health standards that should be utilized and/or followed when individuals are working in or near the tank farms.

a. Applicability of 10 C.F.R. § 851: The "Worker Safety and Health Program," 10 C.F.R. § 851, sets forth the regulatory requirements

WRPS must comply with at the Hanford facility. DOE maintains a system of self-regulation of occupational safety and health issues under 10 C.F.R. § 851, Worker Safety and Health Program (WSHP) at its facilities, which includes the Hanford Site. Code of Federal Regulations including 29 C.F.R. Occupational Safety and Health Administration (OSHA) Standards are specified in 10 C.F.R. § 851.23 ("Safety and health standards") along with consensus standards identified in 10 C.F.R. § 851.27 ("Reference sources") that WRPS and its subcontractors must comply with while conducting activities at the Hanford DOE site. These requirements apply to all WRPS tank farm workers and subcontractors within the WRPS tank farm area of operations as well as any effected adjacent areas and workers. WRPS has developed their own Worker Safety and Health Program manual to meet 10 C.F.R. § 851 requirements. Attached as Exhibit 4 to my declaration is a true and correct copy of WRPS's Worker Safety and Health Program manual (TFC-PLN-47, Rev. C).

b. Applicability of DEAR 970.5223-1: Department of Energy Acquisition Regulations (DEAR) 970.5223-1, "Integration of Environment, Safety, and Health into Work Planning and Execution,"

and DOE Policy 450.4a, "Safety Management System Policy" detail the requirements for implementing a contractor Integrated Safety Management System (ISMS). ISMS requires WRPS to incorporate hazard identification and mitigation measures into all tank farm work controls and operating procedures. Additionally, hazard and exposure monitoring to verify hazard mitigation measures are effective are part of the work planning and execution phases. ISMS's requirements apply to all WRPS tank farm workers and subcontractors.

c. WRPS Industrial Hygiene Program and the Exposure Principle of As Low As Reasonably Achievable for Chemicals: The WRPS Industrial Hygiene (IH) Program is described in the WRPS's Worker Safety and Health Program manual (*see* Ex. 4) and the Tank Farm exposure assessment process is outlined in the WRPS Industrial Hygiene Exposure Assessment Strategy management plan. Attached as Exhibit 5 to my declaration is a true and correct copy of WRPS's Industrial Hygiene Exposure Assessment Strategy management plan (TFC-PLN-34, Rev. E-6). The individual serving as the WRPS IH Program Exposure Assessment Strategy Technical Authority oversees and implements the IH exposure assessment strategy including its design

and final interpretation of monitoring data. That individual has the responsibility for implementing and overseeing the IH Program, as well as ensuring tank farm chemicals hazards are mitigated by implementing a hierarchy of controls in accordance with As Low As Reasonably Achievable (ALARA) principles.[2] Other IH Program Technical Authority exposure assessment strategy responsibilities include: determining if worker exposures are acceptable, unacceptable or uncertain; identifying health-hazard control strategies; and ensuring that the tank farms chemicals of potential concern (COPC) list "is updated as necessitated by periodic IH evaluations," as defined in the Industrial Hygiene Exposure Assessment Strategy management plan. *See* Ex. 5 at 4–5.

d. Hierarchy of Controls: WRPS workers and subcontractors as well as other Hanford workers performing tasks in and around the tank farms are subject to the same workplace safety and health standards (e.g.,

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[2] ALARA principles, in the context of chemical vapors, are those principles geared to exposures to chemical vapors and releases of chemical vapors to the environment as-low-as reasonably achievable, based on technological limitations.

10 C.F.R. § 851, "Worker Safety and Health Program" and DOE policy 450.4A ("Integrated Safety Management Policy"). Each contractor has the responsibility for ensuring hazards within their areas of operations are identified and assessed and hazard prevention and abatement measures to address the hazards are put in place utilizing a recognized and accepted hierarchy of controls, which is defined by the following preferred order (highest to lowest preference): (1) elimination; (2) substitution; (3) engineering; (4) administrative; and (5) personal protective equipment).

10. Paragraphs 11 through 17 contain my opinions of how DOE and WRPS are failing to meet the applicable occupational safety and health standards when individuals are working in or near the tank farms and what actions they should undertake.

11. WRPS Has Failed to Provide a Place of Employment Free from Recognized Hazards. 10 C.F.R. § 851, "General Requirements," requires the responsible contractor (in this case WRPS) to, "Provide a place of employment that is free from recognized hazards that are causing or have the potential to cause death or serious physical harm to workers."

a. An October 30, 2014 report by the Savannah River National Laboratory (the Hanford Tank Vapor Assessment Report (TVAT Report)) noted that WRPS has failed to recognize or predict episodic (bolus) tank vapor exposures even though worker exposures to tank vapors have resulted in medical interventions, and lost or restricted work days for exposed workers have been happening for some 20 years. Ex. 6 at 16–17. Attached as Exhibit 6 to my declaration is a true and correct copy of the TVAT Report. Additionally, over 40 worker exposures from tank farm chemical vapors requiring medical evaluations have occurred since the issuance of the February 2015 WRPS's Implementation Plan (WRPS's response to the TVAT Report). Continued worker exposures indicate that the existing WRPS Worker Safety and Health Program and Integrated Safety Management System requirements are either insufficient to meet regulatory requirements for worker protection or are not being implemented appropriately, or both of these deficiencies exist.

b. Additionally, since tank farm monitoring to date has failed to characterize tank farm vapor emission sources to detect or warn workers of bolus chemical releases, exposures to tank farm workers (and others near the tank farms) are not being maintained as far below the

occupational exposure limit as possible (ALARA principals). Finally, the 2006 Industrial Hygiene Chemical Vapor Technical Basis that WRPS relies on and defines the chemicals of potential concern (COPC) list of tank farm occupational exposure limits (OELs), is incomplete since tank headspace sampling to date has failed to quantify headspace vapor concentrations during tank farm waste disturbing activities. Once the sampling is complete, it will facilitate a more complete evaluation of worker exposures, assign updated or new COPC OELs, and possibly add new COPCs including acute exposure OELs. Attached as Exhibit 7 to my declaration are true and correct copies of excerpts from the CH2MHill, *Industrial Hygiene Chemical Vapor Technical Basis* (May 2006).

12. Current WRPS 8-Hour Time-Weighted Average Occupational Exposure Limits Are Inappropriate for Bolus-Types of Exposures and Insufficient to Protect Tank Farm Workers. The WPRS Industrial Hygiene Exposure Assessment Strategy needs to be revised to include short-term exposure limit and ceiling OEL sampling strategies. Once this sampling is completed, the Industrial Hygiene Vapor Technical Basis COPC OELs should be updated to include OEL-short-term exposure limits and OEL-ceiling limits.

a. WRPS's current Industrial Hygiene Exposure Assessment Strategy for all tank farm COPCs is based on full-period (eight-hour time-weighted average (TWA)) OELs (designed to protect against long-term health effects). *See* Ex. 5 at 7, 11, 14. These 8-hour TWA OELs fail to account for acute exposures to tank farm chemicals that are fast-acting, can result in physical irritation, or acute health effects associated with bolus-type exposures. 8-hour OELs are inappropriate to prevent such acute exposures and the use of these TWA sampling methods and associated OELs has proved ineffective at both documenting bolus exposures and protecting workers.

b. WRPS's Industrial Hygiene Exposure Assessment Strategy, dated February 22, 2013, does not provide guidance or procedures on the application of short-term monitoring data or instantaneous direct reading instrument readings for comparison against tank farm COPCs short-term). These deficiencies with both the IH exposure assessment strategy and the COPC OEL list (which fails to account for acute OELs) have resulted in insufficient exposure assessments to prevent potential tank farm worker vapor exposures at or above a potential OEL-short-term or OEL-ceiling limits and not in keeping with ALARA principles.

c. The TVAT Report's overarching recommendation number four recommended the implementation of a revised IH exposure assessment strategy that includes establishing acute OEL. Ex. 6 at 17. The "Risk Characterization" section of the TVAT Report also addressed the use of chemical vapor short-term exposure limits and OEL-ceiling limits as they are more protective of workers when exposures occur at very high levels for very short durations. Ex. 6 at 46–51. OEL short-term exposure limits (OEL-STEL) and ceiling OELs are more applicable to the nature of tank farm bolus exposures than the existing COPC tank farm 8-hour TWA OELs. WRPS should immediately implement these recommendations in this area of deficiency noted in the TVAT report.

d. An OEL-STEL is defined as, 1) a less than a 15-minute exposure that should not to be exceeded at any time during the workday, 2) occur no more than four times per day, and 3) there should be at least 60 minutes between successive exposures in this range. An OEL-STEL is the concentration to which it is believed that workers can be exposed continuously for a short period of time without suffering from 1) irritation, 2) chronic or irreversible tissue damage, 3) dose-rate-dependent toxic effects, or 4) narcosis of sufficient degree to increase the likelihood

of accidental injury, impaired self-rescue, or material reduced work efficiency. *See* Ex. 6 at 48.

e. OEL-ceiling limit is an exposure concentration that should not be exceeded at any time during the working exposure. If instantaneous air concentration measurements are not available, sampling should be conducted for the minimum period of time sufficient to detect exposures at or above the OEL-ceiling value. Ceiling limits are for chemicals causing physical irritation, and are considered no less binding than those chemical OELs based on physical impairment. There is increased evidence that physical irritation may initiate, promote, or accelerate adverse health effects through interaction with other chemicals or biologic agents or through other mechanisms. *See* American Conference of Governmental Industrial Hygienists (ACGIH), *TLV® [Threshold Limit Values] and BEIs® [Biological Exposure Indices]* 4 (2016).

f. Therefore, tank farm characterization needs to be completed to provide the data required to update the Industrial Hygiene Chemical Vapor Technical Basis and to develop and assign OEL-STEL and OEL-ceiling COPCs for chemicals that present fast-acting, short-term or

irritant exposure hazards that are characteristic of previous worker for short duration bolus exposures. The current WRPS IH exposure assessment strategy is deficient and needs to be revised to include both OEL-STEL and OEL-ceiling for tank farm COPCs where appropriate. WRPS committed in its February 2015 Implementation Plan for Hanford Tank Vapor Assessment Report Recommendations to conduct additional characterization of tank farm headspace vapors and to revise the industrial hygiene sampling strategy. *See* Ex. 8 at 12. Attached as Exhibit 8 to my declaration is a true and correct copy of WRPS's Implementation Plan. Specifically, WRPS committed to "increased exposure monitoring and sampling strategies" and to "incorporate additional monitoring programs based on short episodic releases from tank farm sources and other appropriate forms of short-duration exposures sampling (e.g., alternative personal sampling), in addition to Short-Term Exposure Limit sampling/monitoring. The program will account for more than traditional TWAs, but also bolus-type events. (Phase 1)." Ex. 8 at 8, 21.

g. WRPS's February 2015 Implementation Plan reported a status of "In Progress" for this TVAT recommendation. *Id.* However,

WRPS's Industrial Hygiene Exposure Assessment Strategy plan (*see* Ex. 5) has not been updated to reflect this stated progress status and to provide Industrial Hygiene Program guidance and direction to field industrial hygienist and industrial hygiene technician staff. Until the characterization of tank farm headspace vapors (to include waste disturbing activities) is complete to allow for data analysis in order to develop OEL-STEL and OEL-ceiling COPCs, the IH Tank Vapor Technical Basis COPCs and IH Sampling Strategy will remain deficient and workers will remain at risk of chemical exposures. This deficiency also negatively impacts the ability of tank farm vapor monitoring efforts to assess worker short-term exposures since no tank farm OEL-STEL and OEL-ceiling COPCs have been established to compare real-time instrument data and short duration sampling results to be evaluated against. Again, WRPS should immediately implement the TVAT recommendation related to this issue.

13. WRPS Has Not Effectively Implemented and Effective Industrial Hygiene Hierarchy of Controls.

a. 10 C.F.R. § 851.22(b), "Hazard Prevention and Abatement" states, "Contractors must select hazard controls based on the following

hierarchy: (1) Elimination or substitution of the hazards where feasible and appropriate; (2) Engineering controls where feasible and appropriate; (3) Work practices and administrative controls that limit worker exposures; and (4) Personal protective equipment."

b. WRPS's Worker Safety and Health Program management plan requires controls to be selected according to this same hierarchy. That plan states, "The TOC (Tank Operations Contractor) has established and implemented a hazard prevention and abatement process. This process ensures all identified and potential hazards are prevented or abated in a timely manner." Ex. 4 at 11. However, the means of addressing potential tank farm hazards has not followed the hierarchy of hazard controls in several ways, which has resulted in continued worker exposure to tank farm vapors. WRPS has elected to use limited ventilation in the double shell tanks, administrative controls, and PPE as their preferred controls to mitigate tank farm vapors. Given that workers outside the existing Vapor Control Zones (VCZ) and vapor reduction zone (VRZ) have experienced signs and symptoms of exposure, the existing ventilation for the double shell tanks and administrative control zones (VCZ/VRZ) have proven to be inadequate as control measures.

c. Although PPE is provided for workers conducting specific tank farm operations within the VCZ, no PPE or other protection for those workers outside the VRZ near or adjacent to tank farm operations is provided. Additional administrative controls and the engineering controls are needed to prevent tank farm worker exposures and eliminate or significantly reduce exposure to other workers in the vicinity not directly involved with tank farm operations. WRPS's failure to implement effective controls in inconsistent with their commitment to maintain tank farm chemical exposures ALARA.

14. Industrial Hygiene Technical Basis, Guidance, and Implementation of New Phase 1 Sampling and Exposure Monitoring Activities Must Be Documented.

a. WRPS's TVAT Response Phase I Project Execution Plan discusses additional air sampling that will take place, as part of the Phase I effort, in response to the TVAT Report findings and recommendations. *See* Ex. 9. Attached as Exhibit 9 to my declaration is a true and correct copy of WRPS's TVAT Response Phase I Project Execution Plan. The Project Execution Plan states, "There is significant historical data on tank head space characterization, but the TVAT

identified gaps in that data. The data does not account for possible stratification of gases within the tank head space nor does is account for the effect of waste disturbing activities (i.e., mixing and/or waste transfer into a tank) on the tank head space gases." Ex. 9 at DOE0002453. The Project Execution Plan goes on to describe new IH "routine" surveys to be conducted: "The IH Routines Program will initially help in the development of the characterization of the tank farms. It will utilize new detection instrumentation to look for existing and potentially newly identified COPCs from the tank head space characterization effort. The IH Routines Program will develop a survey grid for each tank farm that will document known emission sources and also look for and document fugitive emission sources." Ex. 9 at DOE0002454.

b. It is undefined how WRPS's new head space characterization and IH Routines Program data will be incorporated into the exiting WRPS Industrial Hygiene Programs and Procedures, IH Exposure Assessment Sampling Strategy, and work planning and control processes to reduce worker exposures. There is no approved procedure for the new IH Routine sampling and monitoring, and it is not part of the existing Industrial Hygiene Exposure Assessment Strategy plan, section

1.2, Objectives of the Exposure Assessment Strategy. *See* Ex. 5 at 2–3. The Industrial Hygiene Exposure Assessment Strategy plan needs to be revised to incorporate the IH Routines Program and document how this new data will be used as part of the overall IH Exposure Assessment Strategy, development of or revision to existing 8-hour OELs, as well as the use of this data for establishing new acute OELs (e.g., Short-Term Exposure Limits and OEL-Ceiling) for tank farm vapor COPCs.

c. The methodology and sampling strategy to be used by IH staff conducting these sampling and monitoring efforts must also be defined. Under the current sampling strategy employed, turnaround time to receive both area and personal sampling results from the analytical laboratory is poor. Where samples are collected as part of the IH Routines Program, sample turn-around-time should be improved to provide for timely access to sampling results by WRPS IH staff and workers. Sampling and real-time monitoring data from all activities should be provided to workers as soon as possible to improve transparency and full disclosure.

d. The mechanism for incorporating the newly acquired Phase 1 sampling results and area monitoring data from the IH Routines

Program into workplace hazard and control requirements such as new and existing General Hazards Analysis, Job Hazard Analysis, and tank farm planning and work controls must be defined and documented. This is required by the Integrated Safety Management System Core Functions (DOE P 450.4A) and documented hazard assessment to meet 10 C.F.R. § 851.21 and DOE's standard for - Industrial Hygiene Practices (STD-6005-2001). *See* Ex. 10. Attached as Exhibit 10 is a true and correct copy of the April 2001 DOE-STD-6005-2001, Industrial Hygiene Practices.

e. The IH Routines Program appears to be being conducted in an effort to demonstrate parity with the Health Physics Technician routine radiological surveys which are prescribed based on the established 10 C.F.R. § 835, Occupational Radiation Protection. An IH Routine Program, as described in WRPS's TVAT Response Phase I Project Execution Plan and draft Tank Farm Operating Procedure ("Perform IH Routines," USQ #TF-16-xxxx-D, Rev 0), consists of routine periodic monitoring of chemical vapors in certain areas of the tank farms. However, the technical basis or guidance for selection of appropriate chemical vapor exposure monitoring equipment for each tank

vapor COPC, the establishment of vapor action and exposure limits detected by monitoring equipment for comparison to existing OEL-STELs and OEL ceilings, and integration of the IH Routines Program exposure data into existing IH databases and for use in work control planning and execution are not defined. For example, the following Industrial hygiene technical issues remain unresolved and undocumented:

(1) What specific tank waste vapor COPCs are to be measured at each tank and where at the specific tank farm will monitoring be conducted during each IH Routine monitoring event?

(2) What is the IH technical methodology and decision logic for the selection of each IH instrument(s) and or sampling methods used to quantify selected COPCs in each tank farm during IH Routines? How will this rationale for selection of instruments and sampling methods be documented and communicated by industrial hygiene professionals to industrial hygiene technicians conducting the monitoring and tank farm workers?

(3) What instrument correction factors are applied to specific COPCs during or following field calibration with span gases used to validate the instruments response? How will the instruments response be interpreted without knowing the correction factor for tank farm vapor specific compounds present?

(4) How will tank farm COPC with low OELs or AOELs (i.e., parts per billion) for agents such as furans, substituted furans, nitrosamines, and carcinogens be measured and distinguished with existing WRPS direct reading instruments from each other and other tank farm chemical classes and mixtures present at orders of magnitude higher concentrations?

(5) How will the technical approach and basis for addressing limits of detection and potential multiple COPC interferences for both direct reading instruments, grab samples (using a plastic Tedlar® bag or Summa canister to collect gas samples), colorimetric detector tube samples, and other sampling methods that maybe conducted be

documented to ensure all COPC exposure data and samples are defensible?

(6) What OEL values will IH Routines Program monitoring data be compared against to assure newly found or existing fugitive emissions sources do not present an unacceptable exposure to workers? Since the Tank Farm Technical Basis only provides tank farm COPC for 8-hour TWA OELs for the COPCs and no OEL-STELs OEL-ceilings, it is unclear how the monitoring data will be used in evaluating potential worker exposures. This comparison of data to short-term and ceiling limits is critical for evaluating existing vapor hazard administrative controls such as vapor control zones and personal protective equipment requirements as well as documenting source vapor exposures and communicated this information to tanks farm workers.

(7) Since WRPS has not defined OEL-STELs or OEL-ceilings for the tank farm COPCs and there is no approved written IH Routine Program procedure, what exposure or action limit for each instrument will used to determine a potential

worker exposure hazard exists for fugitive emission sources encountered and how will the specific COPC(s) measured be determined?

(8) What specific industrial hygiene technician instructions on actions will be taken during IH Routines if a COPC action level or WRPS tank farm OEL is detected and how will this be documented? How will this information be communicated to workers in the area, tank farm operations, and others to alert them of potential releases or abnormal events?

(9) How will IH technical guidance and instruction on how this new IH Routines Program area monitoring data be documented; what IH data repository it will be entered into; and how will area exposure fugitive emission data be tracked and trended to provide actionable information to both tank farm operations and work control planning and execution functions?

f. The DOE's Office of River Protection highlighted similar IH technical deficiencies and lack of formal guidance for industrial

hygiene technicians in its 2009 IH Technical Basis Assessment. Attached as Exhibit 11 to my declaration is a true and correct copy of DOE's Office of River Protection's March 10, 2009 Industrial Hygiene Technical Basis Assessment, Final Report A-09-ESQ-Tankfarm-001. That Assessment reported of the WRPS IH Program that, "[t]here is an absence of written methodologies that normally provide the basis for the selection of PPE and some Direct Reading Instruments, which is a fundamental programmatic necessity. There is also a lack of strategic sample planning and data management, which is reportedly being addressed through the support of an expert IH consultative panel." *See* Ex. 11 at PL-HC_00000727. Deficiencies in reporting of IH monitoring data back to line management was also addressed in the TVAT Report. *See* Ex. 6 at 56–57. These concerns also apply to the new Phase 1 area exposure monitoring technologies that are being deployed as part of the WPRS Phase 1 efforts. Documented technical guidance and methodology is needed on instrumentation and equipment selection, calibration, use, limitations, interferences, data interpretation, documentation and recordkeeping. How this data will be communicated to tank farm operations, IH staff, and planners must be included in a

revision to the existing Industrial Hygiene Exposure Assessment Strategy.

15. DOE and WRPS Must Implement Additional Controls to Further Mitigate Potential Exposures to Workers Conducting Tank Farm Operations and for Workers in Adjacent or Co-Located Areas.

a. It has been demonstrated by past worker exposure events that the existing tank farm operations VCZ and VRZ have not been adequate to prevent workers outside these controlled areas from experiencing signs and symptoms of exposure to tank waste vapors.

(1) The TVAT modeling indicated that under certain weather conditions, concentrations approaching 80 percent of the head space concentration could exist 10 feet downwind from the release point and potentially in workers' breathing zones. *See* Ex. 6 at 9. Additionally, Plaintiff expert Charles Halbert concluded, "that each of the models that DOE and WRPS has used – and that I have reviewed – has substantive limitations and shortcomings that negatively affect its ability to accurately and reliably estimate maximum expected peak short-term concentrations in the breathing zone." *See* Declaration of Charles

Halbert at page 29, ¶ 45. The methodology for establishing VCZs/VRZs should take into account the episodic and dispersive nature of potential releases into worker breathing zones that are associated with specific work activities and meteorological conditions. *See* Ex. 6 at 62. The VCZs must be expanded well beyond the current five foot radius to provide a more protective administrative control for tank farm workers, persons within the tank farm operations areas or buildings, persons near but outside the tank farm fence line.

(2) The VRZs should be extended beyond tank farm fence lines as needed during waste transfer and disturbing activities and other operations with the potential to generate fugitive emissions of tank vapors to provide a greater buffer area for adjacent or collated workers not assigned to the specific tank operation being worked and who are not wearing PPE to prevent potential exposures.

(3) A written procedure for establishing and changing tank farm VCZs is required. There is no written industrial hygiene procedure that provides consistent and defensible decision logic for

establishing, changing the size of or eliminating the VCZs. Rather, WRPS industrial hygiene staff rely heavily of professional judgement and past tank farm vapor sampling and monitoring that did not include tank farm COPC OEL-STELs or OEL-ceilings.

b. WRPS's Personal Protective Equipment Procedure (Managers/Supervisors Responsibilities) states, "Eliminate or control hazards through process/material substitution, engineering, or administrative actions (in that order of preference) prior to relying on the use of PPE as the protective method."

(1) Contrary to WRPS's Personal Protective Equipment Procedure, WRPS has elected to utilize limited engineering controls (ventilation), administrative controls such as signage and barriers, VCZs and VRZs, and the least preferable control in the hierarchy of controls, personal protective equipment (PPE). PPE is the least preferable control option because it can fail and there may be no additional line of defense if it does. The primary respiratory protection selected has been supplied-air respirators or self-contained breathing apparatus (SCBAs) for high-hazard operations (tank farm operations with the highest potential for vapor release

and worker exposure). Due to limitations with tank farm chemical vapor sampling and characterization data, respirators with cartridges cannot be reliably used, because the specific tank farm COPCs and associated vapor concentrations to develop cartridge change-out schedules have not been determined.

(2) Since WRPS has not provided a phased defensible approach for downgrading from SCBA or supplied air respirators, the continued use of SCBA or supplied air respirators must continue for all tank farm waste disturbance, transfers, pumping and all other tasks that have the potential for generating chemical vapor exposure events in excess of the WRPS COPC OELs. This requirement should be standard procedure until such time as WRPS has provided objective evidence of the phased defensible approach to downgrade SCBA or supplied air respirators based on reliable data as defined in the TVAT Response Project Execution Plan (T1P135-PLAN-001). *See* Ex. 9 at DOE0002451–2452.

c. The vapor control issues for DOE and WRPS are not new and have resulted in numerous worker exposures for more than 20 years. Ex. 6 at 11. A concerted effort to deploy additional engineering control

is needed to prevent future exposures to workers not in PPE and to be able to downgrade from the highest level of respiratory protection since SCBAs and supplied-air respirators can create additional hazards (e.g., limiting vision field, tripping, falls, heat stress).

d. WPRS stated in its response to TVAT Overarching Recommendation number seven regarding improving engineering controls that, "The tank farms contractor **has established** a Chemical Vapor Solutions Team (CVST) subcommittee (Engineering Controls) to evaluate current field-deployed technologies and newly developed technologies." Ex. 8 at 8 (emphasis added). However, it is unclear how such evaluated engineering controls and field-deployed technologies have been implemented by tank farm operations if at all to date. The field-deployed technologies stated in the WRPS Implementation Plan are needed urgently to prevent further worker exposures.

e. Since the sources of the tank vapors emissions and nature of unplanned vapor releases resulting in the bolus exposures to workers have not been clearly identified and effective engineering controls to mitigate tank vapor releases at these sources have not been installed, engineering controls such as real-time monitoring with alarming sensing

technology at vapor vent stack and emission points to alert worker to changing site conditions or releases from fugitive emission points need to be installed as soon as practical to mitigate further worker exposures.

16. A robust medical surveillance program that follows up with exposed workers to evaluate short- and long-term consequences from vapor exposures, and clearly details medical surveillance procedures must be developed and maintained to provide for long-term epidemiological tracking of exposed workers.

a. The specific nature of the tank farm medical surveillance program (routine tests performed and their purpose, long-term medical data tracking) should be described in writing and communicated to all tank farm workers.

b. Written procedures to be followed by the worker, WRPS, and HPMC in the event of a suspected chemical exposure (worker is reporting or demonstrating symptoms when medically evaluated), including a list of medical facilities that are appropriately equipped and staffed during non-standard work shift hours to respond to this event, and follow-up procedures after release from the medical facility, should be communicated with tank farm employees.

c. Medical facilities designated by WRPS for use by employees in the event of a suspected exposure should understand the potential tank farm COPCs that may be involved with an exposure. Those facilities should also have access to the tank farm-specific industrial hygiene chemical vapor data and personal sampling and monitoring results at the time of the incident to better understand the potential relationships between specific tank farm vapor COPCs and the worker signs and symptoms of exposure they present with when arriving for medical services.

d. Appropriate long-term observational epidemiology studies should be developed and conducted using information collected by HPMC and other local medical facilities where workers are evaluated and treated to study the long-term health consequences of worker's experiencing acute and chronic tank vapor exposures and track exposed worker's long-term health.

e. More direct involvement of HMPC medical staff with WRPS and ORP Industrial Hygiene personnel is needed to verify: that HMPC staff understand the COPCs and underlying OEL health-risk basis; that medical staff consider tank vapor mixture toxicological and

related symptoms of exposure; and that HMPC tank vapor exposure response procedures and protocols are regularly and systematically evaluated based on the updated COPCs, tank vapor toxicological information (including mixtures), and acute- and long-term tank farm worker exposure epidemiological tracking objectives.

17. Additional work and refinement is needed in training procedures for on-site Industrial Hygiene professionals to allow them to appropriately anticipate and respond to conditions that may lead to tank worker exposures.

a. Industrial Hygiene professionals need to be trained to recognize conditions under which exposure to tank vapors is more likely, and to be able to advise tank workers in basic procedures to avoid or minimize exposures.

b. Industrial Hygiene professionals need to be trained to understand the types and locations of historic tank vapor releases that have occurred resulting in worker exposures, the best way to monitor or sample these releases, and the limitations on the IH equipment and sampling techniques to appropriately understand and communicate the results of this monitoring/sampling to workers.

c. Industrial Hygiene professionals need to be trained in effective communication techniques to allow them to better assist tank workers in understanding the vapor hazards at the tank farms and recognize these potential hazards and mitigation measures to prevent exposures.

d. The Industrial Hygiene Routines procedure needs to be formalized and approved to provide instructions on conducting IH rounds, precautions and limitations for the industrial hygiene technicians, and the response actions if new tank farm vapor fugitive emissions sources are identified.

18. I have reviewed a June 20, 2016 letter from David E. Molnaa, President of the Hanford Atomic Metal Trades Council (HAMTC) to Kevin Smith, Manager of DOE Office of River Protection and Mark Lindholm, President and Project Manager of WRPS. *See* Ex. 12. Attached as Exhibit 12 to my declaration is a true and correct copy of David E. Molnaa's June 20, 2016 letter to Mr. Smith and Mr. Lindholm. In this letter, Mr. Molnaa expressed his concern concerning safety and health of the Hanford workforce who perform activities in and around the Hanford tank farms. Ex. 12 at 1.

a. In his June 20 letter, Mr. Molnaa included the following actions HAMTC demanded DOE and WRPS to immediately implement in order to protect the Hanford workforce:

(1) All work activities which causes, or may potentially cause, the emission of chemical vapors including intrusive, sluicing, retrieval, transfers, pumping, sampling, mixing, breaching, venting, vessel dump, air abatement, leaks, spills, airlift circulation, caustic additions, invasive, disturbing, etc. shall be performed on backshifts and weekends;

(2) During all work activities as described in Number 1 above, a vapor control zone shall be established no less than 200 feet away from the perimeter fence line of the applicable tank farm in which the above described work is occurring;

(3) All work inside the established vapor control zone shall be performed while wearing mandatory supplied air;

(4) All roads and access points shall effectively be barricaded to prevent/restrict unauthorized entry into the vapor control zone and shall be strictly monitored and enforced;

(5) All work inside the perimeter fences of any tank farm shall be performed while wearing mandatory supplied air;

(6) All SCBA bottles shall be limited to 30-minute cylinders. All use of the 60-minute cylinders shall immediately be discontinued and removed from service. In addition, more emphasis should be placed on acquiring alternative supplied air respirators such as re-breathers, lighter cylinders, and more advanced equipment and ergonomically designed harnesses such as the MSA G-1 system;

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(7) Ensure effective communication is provided to all the site contractors prior to any activities referenced in number 1 above.

Ex. 12 at 2.

b. Also in his June 20 letter, Mr. Molnaa included the following actions that HAMTC strongly recommended DOE and WRPS undertake:

(1) Improved turnaround times for sampling results, both personal and environmental;

(2) Ensure the workers are provided access to all data in order to promote transparency and full disclosure;

(3) Improved medical and first aid coverage by HPMC;

(4) Increased emphasis on implementing TVAT recommendations in a timely manner;

(5) Relocate all non-essential personnel, equipment and trailers out of the surrounding areas of the tank farms and out of the vapor control zones. In addition, abandon any further strategies to place additional personnel, equipment or facilities around the surrounding areas of the tank farms;

(6) Reader boards indicating the work activity with visual and audible alarms;

(7) Ensure all personnel are provided with effective communication resources while performing work in and around the tank farms (hand-held and vehicle radios, site-wide announcements, etc.);

(8) Improved [industrial hygiene technician] training and equipment;

(9) Improved monitoring equipment, both personal and environmental;

(10) Improved exposure assessments, exposure controls, safety and health management policies and operational procedures;

(11) Ensure adequate de-con resources are available in the event of a radiological and/or chemical vapor incident.

Ex. 12 at 2.

c. Implementation of HAMTC demands 1 through 7 and recommendations 1 through 11 would provide additional protective measures for the tank farm operations workers and others in and around the immediate tank farm areas. These demands are reasonable interim controls that can be implemented until WRPS can complete characterization of tank farm headspace vapors to develop short-term and ceiling occupational exposure limits as well as install continuous air monitoring equipment that will alert tank farm workers of bolus exposure events and allow for rapid evacuation of the area. The adaption of HAMTC recommendations 1 through 11 (some of which are addressed in my declaration opinions) would provide enhanced worker protections.

DATED this 15th day of July 2016, in Idaho Falls, Idaho.

BRUCE MILLER

APPENDIX

1. Code of Federal Regulations, Title 10 - Energy, Chapter III - Department of Energy, Part 851 - Worker Safety and Health Program (Jan. 1, 2012)

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6. The November 3–4, 2014 SRNL TVAT Report Briefing (PowerPoint), Hanford Advisory Board Minutes, Tank Waste Committee, Attach. 2 (Nov. 13, 2014) (http://www.hanford.gov/page.cfm/TWCSummaries)

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and Vitrification Exposure-Based Health Issues Analysis, PNNL-13722 (Nov. 2001)

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44. Defendant Washington River Protection Solutions, LLC's Objections and Responses to State of Washington's Interrogatories and Requests for Production to Washington River Protection Solutions, LLC (May 2, 2016), *Hanford Challenge v. Moniz*, No. 4:15-cv-05086-TOR (E.D. Wash July 20, 2016)

45. Letter dated June 20, 2016, from David E. Molnaa, President of the Hanford Atomic Metal Trades Council to Kevin Smith, Manager of DOE Office of River Protection and Mark Lindholm, President and Project Manager of WRPS

46. Deposition of Kenneth Way, *Hanford Challenge v. Moniz*, No. 4:15-cv-08086-TOR (E.D. Wash July 20, 2016)

47. Deposition of Robert Gregory, *Hanford Challenge v. Moniz*, No. 4:15-cv-08086-TOR (E.D. Wash July 20, 2016)

48. Deposition of Thomas Fletcher, *Hanford Challenge v. Moniz*, No. 4:15-cv-08086-TOR (E.D. Wash July 20, 2016)

49. Declaration of Charles Halbert, *Hanford Challenge v. Moniz*, No. 4:15-cv-08086-TOR (E.D. Wash July 20, 2016)

50. Declaration of Joyce Tsuji, *Hanford Challenge v. Moniz*, No. 4:15-cv-08086-TOR (E.D. Wash July 20, 2016)

51. Declaration of Russell Ogle, *Hanford Challenge v. Moniz*, No. 4:15-cv-08086-TOR (E.D. Wash July 20, 2016)

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DATED this 21st day of July 2016.

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